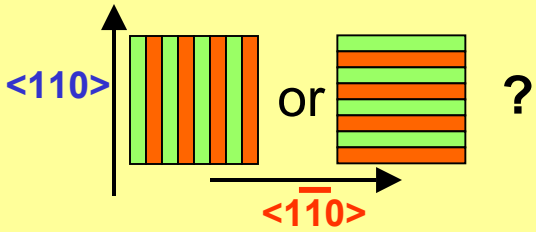
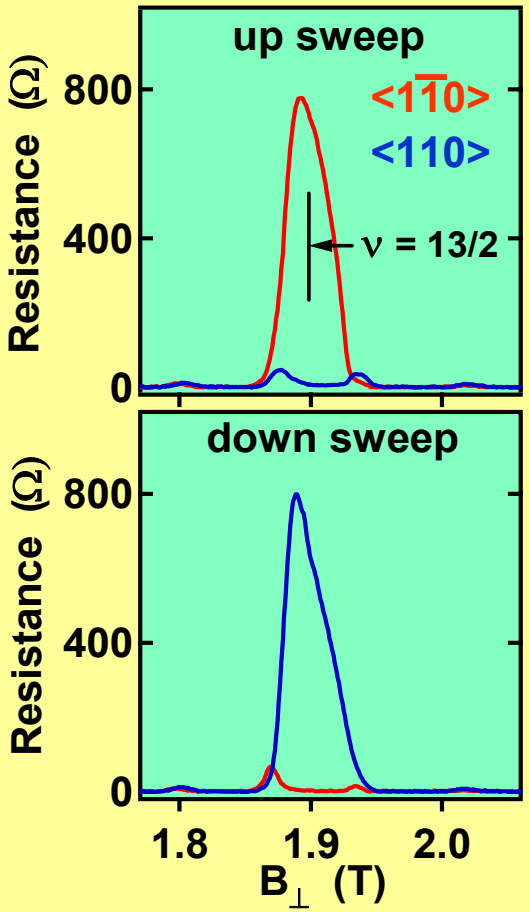
Metastable Orientation of Stripe Phases in High Landau Levels

J.P. Eisenstein - Caltech DMR 0242946



We have demonstrated that the *anisotropic stripe phases* recently discovered in 2D electron systems at high Landau level occupancy can exhibit *two orthogonal orientations*. In general, one such orientation is only metastable. As the data here shows, we can "prepare" the system in either configuration. These data, obtained after first rendering the two orientations almost degenerate via an applied in-plane magnetic field, reveal that the "hard" resistance direction at Landau filling $\nu = 13/2$ depends the sweep direction of the magnetic field. Up sweeps produce stripes parallel to <110>, while down sweeps select the perpendicular <1$\bar{1}$0> orientation. In general, one orientation is slightly lower in energy than the other, and we have been able to observe the relaxation of the system from the higher energy metastable state to the lower energy equilibrium configuration. These results demonstrate that the mysterious native symmetry-breaking potential responsible for orienting the stripes possesses two orthogonal local minima. What further reduces the symmetry from 4-fold to 2-fold remains unknown.



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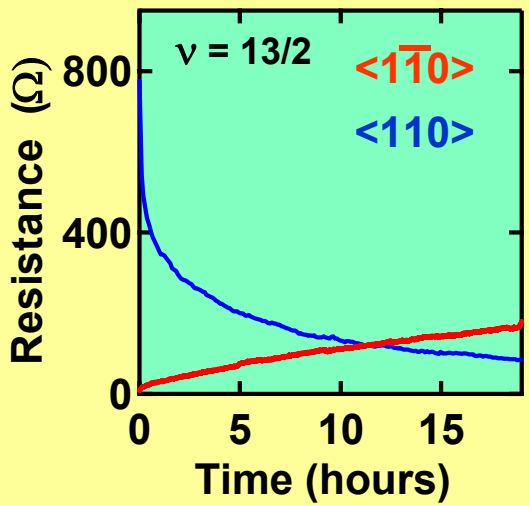
Related Manuscripts: "Metastable Resistance Anisotropy Orientation of Two-Dimensional Electrons in High Landau Levels", cond-mat/0309625, and submitted to *Physical Review Letters*.

Major Presentations: "Liquid Crystals of Electrons?", One of three **invited** Morris Loeb Lectures at Harvard University, February 2003.



Time dependence of the longitudinal resistances at ν = 13/2 at T = 50 mK. The blue trace is the resistance with current directed along <110> while the red trace is for current along <1$\bar{1}$0>.

These data were obtained after sweeping the magnetic field *down* to ν = 13/2. This prepares the system in a metastable configuration in which the stripes are oriented parallel to <1$\bar{1}$0>. Evidently, the true equilibrium configuration has stripes parallel to <110>. The relaxation from the metastable state takes many hours.